

CLAIMS

What is claimed is:

1. A method of treating a granular metallic material to affect a grain size of the material, the method comprising:
performing a friction stir processing operation on the material, the friction stir processing operation comprising passing a rotating head of a friction stir welding tool through a surface thickness of the granular metallic material in a treatment path.
2. The method of claim 1, wherein the friction stir processing operation is devoid of a friction stir welding operation.
3. The method of claim 1, wherein the treatment path includes a treatment pattern, the treatment pattern lying within a surface region of the granular metallic material.
4. The method of claim 3, wherein a first treatment path in the treatment pattern overlaps with a second treatment path in the treatment pattern.
5. The method of claim 3, wherein in the treatment pattern includes a raster pattern.
6. The method of claim 3, wherein the treatment pattern includes a spiral pattern.
7. The method of claim 3, wherein the treatment pattern includes a reciprocating pattern.
8. The method of claim 3, wherein the treatment pattern includes a serpentine pattern.
9. The method of claim 1, wherein the surface thickness of the granular metallic material is in the range 1 to 20 millimeters (approximately 0.4 to 7.9 inches)

10. The method of claim 1, wherein the method of treating the granular metallic material further comprises performing an annealing operation on the granular metallic material.
11. The method of claim 10, wherein the annealing operation is performed at a temperature in the range of 500 to 600 degrees Celsius.
12. The method of claim 10, wherein the annealing operation is performed for a duration in the range 0.01 to 24 hours.
13. The method of claim 1, wherein the granular metallic material includes aluminum.
14. A computer-readable storage medium, the computer-readable storage medium including instructions that when executed by a computer, cause the computer to perform operations comprising, at least:
 - implement a friction stir processing operation on a granular metallic material to affect a grain size thereof, the friction stir processing operation comprising passing a rotating head of a friction stir welding tool through a surface thickness of the granular metallic material in a treatment path.
15. A computing apparatus, the computing apparatus comprising:
 - a processor; and
 - a memory storing instructions that, when executed by the processor, configure the computing apparatus to perform operations comprising, at least:
 - implement a friction stir processing operation on a granular metallic material to affect a grain size thereof, the friction stir processing operation comprising passing a rotating head of a friction stir welding tool through a surface thickness of the granular metallic material in a treatment path.